Map-off the city: How uncertain places are represented in sketch maps

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Abstract

The paper evaluates different visualization techniques for uncertain places in route sketch maps. Vague places, for instance, are often used in daily communication but there is a lack of extensive research on how to visualize them. In this study, we asked 20 participants to draw a specific route on the sketch maps with selected places in the city that have uncertain boundaries. A previously developed visualization classification scheme is used to categorize them. We found that participants usually combine labels with any bounded shape to represent uncertain places. This is followed by the use of a simple label to visualize the place in the sketch maps. The various classifications provide ideas of how uncertain places may be visualized and the results may be incorporated in designing better interfaces for various information systems.

Keywords: uncertainty, route sketch maps, wayfinding, navigation, orientation.

1 Introduction

Uncertainty refers to imperfect representations of the real world which include both verbal descriptions and visual representations such as sketch maps. This can take the form of *inaccuracy,* where elements are either added or removed leading to an erroneous representation or *imprecision* where the state of the real world and its semantics are not specific enough to represent [1]. In our study of uncertain places, we focus on the latter which could arise due to *ambiguity* (multiple definitions or possible interpretations) and *vagueness* (imprecise definition leads to borderline cases) [2].

Places that are uncertain, especially vague ones are hardly represented on metric maps, owing partly to the difficulty in visualizing them. But, people often use them in communicating about the environment [3] such as in giving wayfinding instructions. We also refer to these places to convey an idea of direction to take and for orientation purposes even though it may not be the destination. Sketch maps are a good source to elicit information about such places. The use of vague places in route descriptions both in verbal instructions and in sketch maps is not extensively explored in many studies. Hence, this paper attempts to fill this gap by providing insights of how such places are visualized based on people's knowledge that was drawn on sketch maps. The following sections present the experiment design, results, discussion and conclusion in the broader scope of our ongoing research in wayfinding.

2 Experiment

2.1 Participants

A total of 20 participants (11 males, 9 females) aged between 20 and 35 years (M = 27.7 years, SD = 4.3) took part in the experiment. The participants are mostly university students from various fields of study who have been living in the study area for a minimum of six months. The rest of the participants are university employees. They received 10€ as payment for participation.

2.2 Study Area

The study area is in Muenster, a major city in Germany, which is also considered as a university town.

2.3 Design

In the experiment, participants were assigned to either of the two groups (A and B) consisting of different tasks. Participants who received Experiment A were asked to draw a sketch map within a city route (from harbour to natural science campus) while Experiment B was a city to city route (from natural science campus in Muenster to any city in Germany). We identified uncertain places to be drawn in the sketch maps. These places are: *city center, natural science campus, the university hospital, the castle, and the harbour (Hafen).*

3   Results

Our previous paper showed different visualization of vague places [4]. Figure 1 shows the visualization styles we defined based on collected sketch maps. We refer to the previous classifications and found similarities as well as additional visualizations from our current experiment. The following visualizations are: (1) irregular regions (2) unevenly shaded pattern (3) simple label (4) landmark in bounded shapes (circle, rectangle, oval or dashed lines) (5) footprints (6) symbols (7) incomplete shapes. We refer to these visualizations in analyzing the sketch maps in the current experiment.

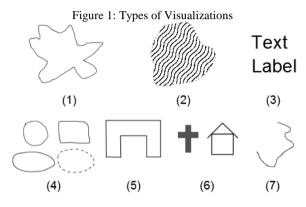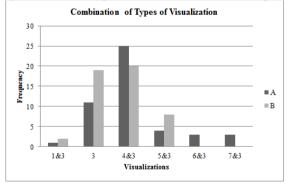Figure 1: Types of Visualizations

Figure 2 shows the visualizations that were common for both experiment types. It shows a combination of landmark in bounded shapes (Visualization 4 or V4) and simple labels (V3) which occurred for both Experiment A and B accounting for 47% and 31% of the total visualizations, respectively. The second visualization type is the use of labels only (V3) comprising 23% in Experiment A and 39% in Experiment B. This was mostly common with 'city center'. Shaded pattern (V2) did not occur in any sketch maps.

Figure 2: Common types of visualizations in sketch maps
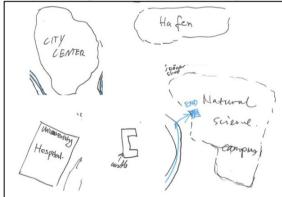

4   Discussion

We compared the results with our previous study where we accounted for all types of visualizations from various sketch maps. Previous results showed that simple labels (V3) appeared to be the most common representation drawn for vague places and is mostly combined with other visualizations. In this study, we focused on the visualization of specific places and the combinations of types used to represent them. Results show that a combination of different types is the common way to visualize the different uncertain places. The most common one uses simple labels bounded in shapes such as circle, rectangle or dashed lines. Labeling (V3) was the second type of visualization. Some visualizations were only used by participants in a particular group, such as symbols (V6) and incomplete shapes (V7) combined with labels which were only shown for Experiment A. Figure 3 shows examples of some visualization from participants' sketch maps.

5   Conclusion

Places with imprecise boundaries or spatial extents are difficult to visualize. In the experiment conducted, participants visualized these places in various ways. Some drew only labels while most of them combined text labeling bounded with various shapes. Symbols were often unused. Since mapping spatial objects entails precise boundaries, representing vague places in maps remains a challenge as people have various ways to visualize them.

Figure 3: Sample visualizations of uncertain places

The result of this study provides ideas of how uncertain places are visualized which may be applied in cartography as well as in developing applications for smart phones for navigation and wayfinding. This paper presents the initial outcome of our ongoing research; hence it was conducted with few participants. However, we are in the process of collecting more data to support our preliminary analysis which we plan to extend for further publication. Furthermore, we intend to explore whether categories of uncertain places are represented using a specific visualization type. The outcome of the study supports our broader ongoing investigation to find a natural way of structuring wayfinding instructions.

Acknowledgement

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